AEROSPACE RECOMMENDED PRACTICE

ARP6199™	REV. B
Issued 2012-06 Revised 2022-02 Superseding ARP6199A	

(R) Method to Evaluate Passenger and Flight Attendant Seats for the Test Requirements of 14 CFR Part 25 Appendix F, Parts IV and V

RATIONALE

The SAE Aircraft Seat Committee developed and approved the original version and revision A of ARP6199 in 2012 and 2017, respectively, with the goal of providing the seat industry with one set of seat heat release special conditions (HRSC) requirements. ARP6199B provides more clarity and some modifications to the existing guidance and presents an updated common criteria for determining which panels on the seat must be evaluated and substantiated.

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1. SCOPE

This SAE Aerospace Recommended Practice (ARP) is only applicable to 14 CFR Part 25 transport airplane passenger and flight attendant seats. This document provides an approach for determining which parts on aircraft seats are required to meet the test requirements of 14 CFR Part 25 Appendix F, Parts IV and V. Additionally, it is recommended to use materials that meets the requirements of 14 CFR Part 25 Appendix F, Parts IV and V in applications where not required.

Independent furniture installations related to seat installations are outside the scope of this document.

2. REFERENCES

2.1 Applicable Documents

The following publications form a part of this document to the extent specified herein. The latest issue of SAE publications shall apply. The applicable issue of other publications shall be the issue in effect on the date of the purchase order. In the event of conflict between the text of this document and references cited herein, the text of this document takes precedence. Nothing in this document, however, supersedes applicable laws and regulations unless a specific examption has been obtained.

2.1.1 Code of Federal Regulations (CFR) Publications

Available from the United States Government Printing Office, 732 North Capitol Street, NW, Washington, DC 20401, Tel: 202-512-1800, www.gpo.gov.

14 CFR Part 25 Airworthiness Standards: Transport Category Airplanes.

2.1.2 FAA Publications

Available from Federal Aviation Administration, 800 Independence Avenue, SW, Washington, DC 20591, Tel: 866-835-5322, www.faa.gov.

Advisory Circular 25-17A (AC 25-17A), Change 1, Transport Airplane Cabin Interiors Crashworthiness Handbook.

FAA Policy Statement No. PS-ANM-25.853-1-R2 Flammability Testing of Interior Materials, July 3, 2013.

FAA Fire Safety Handbook: https://www.fire.tc.faa.gov/Handbook.

2.2 Definitions

The following terminology is used throughout Section 5 and is defined as follows for the purposes of this document.

ARM CAP: A feature (such as foam and leather covering, or elastomeric) that is part of the design of armrests, end bays, or center consoles and is intended to provide support for the passengers' arms.

ARM REST: A feature that provides arm support and may include structural, comfort, and aesthetic components, such as arm caps.

COMPLIANT PANEL: A panel that meets the requirements of 14 CFR Part 25 Appendix F, Parts IV and V, heat release and smoke density will be referred to as "compliant panel" in this section of this document.

DRESS COVERS: Fabrics (woven or non-woven) and leathers (including synthetic leather) are not panels.

DRESS COVER ASSEMBLIES: Dress covers with padding, foam, batting, or cushioning materials.

EXEMPTED PANEL: The applicant may designate up to and including 1.5 ft^2 (1394 cm^2) of non-traditional, non-metallic panel material per seat place that does not have to comply with 14 CFR Part 25 Appendix F, Parts IV and V. For example, a triple seat assembly may have a total of 4.5 ft^2 (4181 cm^2) excluded on any portion of the assembly; e.g., outboard seat place 1.0 ft^2 (929 cm^2), middle 1.0 ft^2 (929 cm^2), and inboard 2.5 ft^2 (2323 cm^2).

NON-BONDED OVERLAPPING PANELS: Panels that are either touching without a bonding agent or with a gap between them.

RESILIENT PANEL: A panel material is resilient if it is an exposed panel and if during a post crash fire event it is unlikely to deteriorate and expose underlying materials; thereby preventing them from affecting the likelihood of a flashover event. A resilient panel design must be itself compliant to 14 CFR Part 25 Appendix F Parts IV and V and its base substrate must fit one of the following:

- Finished or unfinished metallic construction (less than 10% magnesium).
- Thermoset resin glass or carbon fiber reinforced composite (multi-ply construction or a sandwich panel with Honeycomb or foam core).
- Materials (such as thermoplastic) shown by test to be “resilient” as defined in 5.3.3.1.

SEAT PLACE: Seat occupied by a passenger.

TRADITIONAL AFFIXING CRITERIA: The following criteria shall be used to determine when the dress cover of a panel can be considered “affixed around the edges” and therefore not required to be substantiated with the supporting panel:

- If the adhesive is applied within 1.0 inch (2.54 cm) from the edge of a covering, the panel shall be tested without the covering.
- If the adhesive is applied in locations other than within 1.0 inch (2.54 cm) from the edge of the covering, the panel may be tested without the covering if the total amount of adhesive used is equivalent to the amount that would be applied only around the edges.
    - The same criteria must be applied also to coverings attached by means of hook and loop, tape and other similar attachment methods.

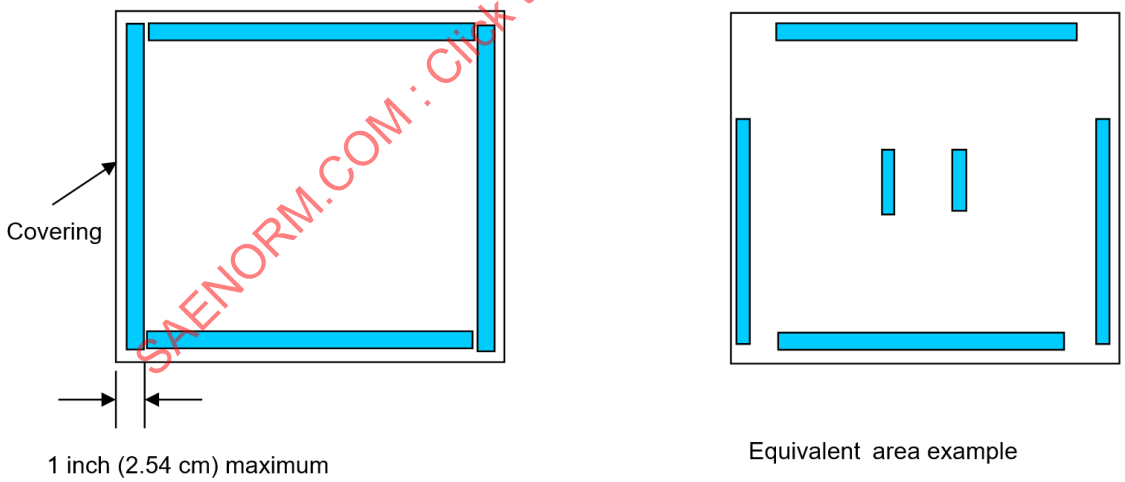


Figure 1 - Examples of adhesive applications that allow panels to be tested without covering material

TTL POSITION: The required position and orientation of the seat during taxi, takeoff, and landing as controlled by the seat manuals, placards, and flight crew instructions for normal operations.

NOTE: Automatically stowed flight attendant seats are evaluated in the stowed position. Manually stowed flight attendant seats are evaluated in the deployed and in the stowed position.

2.3 Acronyms

AC	Advisory Circular
A/C	Aircraft
AFM	Airplane Flight Manual
ARP	Aerospace Recommended Practice
ATC	Amended Type Certificate
CAD	Computer Aided Design
CFR	Code of Federal Regulations
cm	Centimeter
CRI	Certification Review Item
EASA	European Aviation Safety Agency
FAA	Federal Aviation Administration
HR	Heat Release
HRSC	Heat Release Special Conditions
IAT	In-Arm Tray
IAV	In-Arm Video
IFE	In-Flight Entertainment Equipment
MOC	Means of Compliance
m	Meter
mm	Millimeter
OEM	Original Equipment Manufacturer
OSU	Ohio State University
PBE	Protective Breathing Equipment
PC	Personal Computer
PCU	Passenger Control Unit
P/N	Part Number
SC	Special Conditions
SD	Smoke Density
STC	Supplemental Type Certificate
TC	Type Certificate

TTL Taxi, Takeoff, and Landing

> Greater than

≤ Less than or equal to

3. BACKGROUND

In 2007, the FAA released special conditions that held seats to the same heat release and smoke density standard as the rest of the cabin. EASA soon followed with similar regulations. The seat HRSC require heat release and smoke density tests for large, exposed, non-metallic, non-traditional panels that are part of the seat design.

In January 2010, the industry and regulators began meeting to develop common criteria that can be used to determine which panels on a seat require heat release and smoke density substantiation. This activity was concluded in December 2010 and the final criteria were subsequently distributed to all of the industry and regulatory participants.

The following assumptions and ground rules were used in developing this certification approach:

- When 14 CFR Part 25.853(d) was added in the late 1980s, seats were exempted from the rule. It was accepted at that time that there was a certain amount of non-metallic material as part of seat design. It is understood that the seat HRSC are intended to capture the increase (or delta) from that baseline to seats today.
- When determining “traditional” envelopes for different zones on the seat (e.g., center consoles, end bays, etc.), the collective experience of the industry determined reasonable estimates based on a variety of examples from seats of the mid-to-late 1980s era.
- It is assumed that there is some flexibility to meeting the heat release and smoke requirements where safety-related items may not meet the requirements of 14 CFR Part 25 Appendix F, Parts IV and V and also perform their basic function. These can be coordinated with the regulators on a project-specific basis.
- The requirement to test seat panels to the heat release and smoke requirements does not include a requirement to test to 60 seconds vertical burn (14 CFR Part 25 Appendix F, Part I (a)(i)). TC/STC/ATC holders and suppliers can elect to meet this requirement voluntarily.
- Seats are evaluated in the TTL position (see 2.2).

4. SEAT CERTIFICATION

The following tables summarize when compliance must be shown at an aircraft installation level by the installer for heat release special conditions. This takes into consideration that the certification of a seat may be based on a similar seat that was previously certified, or may be a new, stand-alone certification.

Table 1 - New production (line fit) programs

	New Customer	Same Customer, New A/C Model (New Family or New Derivative)	Same Customer, New Block of A/C	Same Customer, Same Block, New Seat Count
Same Seat P/N				
New Seat P/N, No Change to Large Panels	√			
New Seat P/N, Changes to Large Panels	√	√	√	√
New Seat Model	√	√	√	√

√ = Seats must be shown compliant with special conditions.

1. “New customer” relates to a situation where airline “A” has, for example, model “X” airplanes certificated with seats with large non-metallic panels prior to the issuance of special conditions. Airline “B,” after the effective date of the special conditions, purchases model “X” airplanes and may (or may not) have exactly the same seating configuration as airline “A.”

2. “Same customer, new A/C model” means if airline “A” has, for example, model “X” airplanes certificated with seats with large non-metallic panels prior to the issuance of special conditions. The airline now purchases model “Y” or model “Z” airplanes and installs seats in the new model “Z” after the issuance of the special conditions.

3. “Same customer, new block of A/C” means if airline “A” has, for example, model “W” airplanes certificated with seats with large non-metallic panels prior to the issuance of special conditions. The airline now purchases, after the effective date of the special conditions, additional model “W” airplanes.

4. “Same customer, same block, new seat count” means if airline “A” has, for example purchased 50 model “V” airplanes and the first of this block of 50 airplanes has been type certificated with seats with large non-metallic panels prior to the issuance of special conditions. Then on the 15th airplane to be delivered (which is after the effective date of the special conditions), the airline decides to increase the number of first class seats in the airplane and reduce the number of economy class seats.

5. “Same seat P/N” means a seat that is unchanged. In the case where the same P/N is retained, but changes are made to all seats with that P/N (i.e., the prior configuration is eliminated on the drawing and in the field), this is considered as “new” for the purposes of implementation of the special conditions.

6. “Customer” refers to the end user, and not a leasing company, that supplies many operators.

Table 2 - Post-TC modifications (retrofits)

	Installation of Existing Arrangement for Fleet Commonality	Re-Arrangement (or Removal) of Existing Seats (No Additional Seat Installations)	Modification of Seats Installed by Service Bulletin	New Installation of Seats
Same Seat P/N				
New Seat P/N, No Change to Large Panels				√
New Seat P/N, Changes to Large Panels	√	√	√	√
New Seat Model	√	√	√	√

√ = Seats must be shown compliant with special conditions.

7. When modifying a seat installed on an aircraft that has heat release and smoke density as part of its certification basis:

   - Only the seat parts modified as part of the aircraft design change have to be evaluated.

   - If the change does not affect large panels, there is no requirement for a special conditions evaluation.

8. “Same” or “new,” with respect to seat P/N, refers to authority approval status, and whether there is an installation approval, even if it was granted to someone else. The applicant is responsible for both identifying and supplying evidence of the prior approval.

9. “Fleet commonality” means the installer already has this arrangement in their fleet, and is configuring other airplanes to match. Modification is being performed by other than airframe manufacturer.

10. “Re-arrangement” means the seats are moved around, or maybe some are removed, but no additional seats are installed.

11. “New Installation of seats” means that the modification includes installation of more (Table 2, Row 1) or different (Table 2, Rows 2 to 4) seats than the current arrangement. Includes both a new installation, as well as adding to an existing arrangement.

12. With respect to Table 2, Row 2, Column 3, when the same operator/user obtains a post-TC approval (e.g., via STC) to essentially provide fleet commonality with the arrangement as delivered from the factory, Row 2, Column 1, would apply instead. Where a customer/user is obtaining a new installation approval for a new P/N, which happens to be similar to another customer’s approval, the special conditions would apply.

Examples of changes that would be allowed, without requiring additional HRSC evaluation:

- Addition of or removal of electrical components that do not affect large panels.
- Upright and recline setting changes due to an aircraft reconfiguration.
- Dress cover changes and traditional armcap covering changes.
- Small hardware component modifications to modify seat function.
- Changes that do not affect large non-metallic panels.
- The same criteria must be applied also to coverings attached by means of hook and loop, tape, and other similar attachment methods.

5. DETERMINATION OF MATERIALS AND SEAT PARTS THAT REQUIRE EVALUATION USING 14 CFR PART 25 APPENDIX F, PARTS IV AND V

5.1 Meeting the Test Requirements of 14 CFR Part 25 Appendix F, Parts IV and V

Determining the parts to be evaluated using the test requirements of 14 CFR Part 25 Appendix F, Parts IV and V is a two-step process. First, determine which parts on the seat require evaluation; second, determine the method of substantiation. Each component of the seat must be examined against the criteria in Section 5 of this document and, if necessary, substantiated using one of the methods listed below.

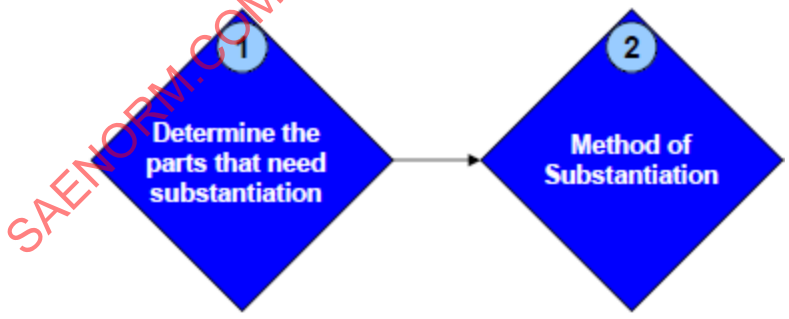


Figure 2 - Diagram of approach

Step 1 in Figure 2: Use Section 5 to determine which parts need substantiation.

Step 2 in Figure 2: Use one of the methods below to substantiate parts identified:

1. Test the panel per 14 CFR Part 25 Appendix F, Parts IV and V.
2. Perform a similarity analysis to eliminate a test.
3. Designate up to and including 1.5 ft^2 of identified material as exempt.

Seat parts shall be evaluated in their TTL position, if this position is controlled. If no such means exist, the seat shall be evaluated in all positions.

Seat parts that meet all of the following five criteria must be evaluated using the methods of 14 CFR Part 25 Appendix F, Parts IV and V. The criteria are listed in the order that should expedite the evaluation process.

1. Is the part a panel? (See 5.2.)
2. Is the part exposed? (See 5.3.)
3. Is the part non-metallic? (See 5.5.)
4. Is the part large? (See 5.6.)
5. Is the part non-traditional? (See 5.9 through 5.29.)

If the answer is yes to all these criteria, the part needs to be evaluated.

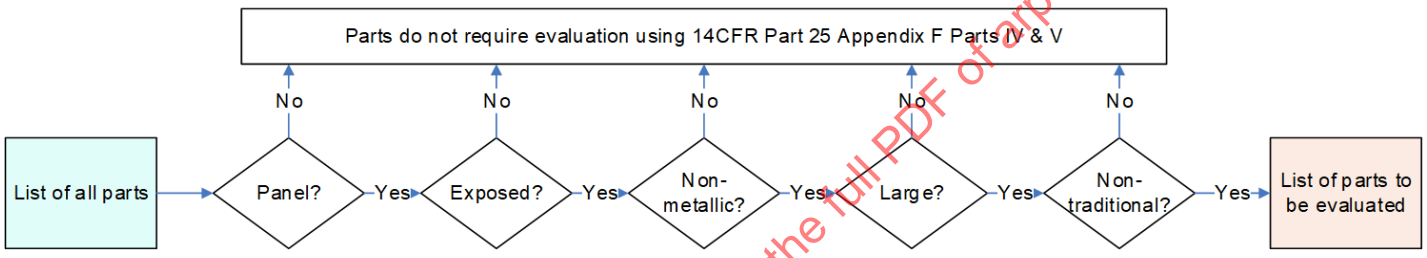


Figure 3 - Illustration of criteria used to determine parts that require evaluation

Installers will evaluate design features that are not addressed in Section 5 (novel and unusual designs) in conjunction with the component's intended functionality.

5.2 Determining if the Part is a Panel

A panel is defined as the surface of single or multiple components that may be attached to or be integral to seat structure.

The seat structure components shown in Figure 4, whether metallic or non-metallic, are not panels. In addition to the items in Figure 4, baggage bars are not considered panels.

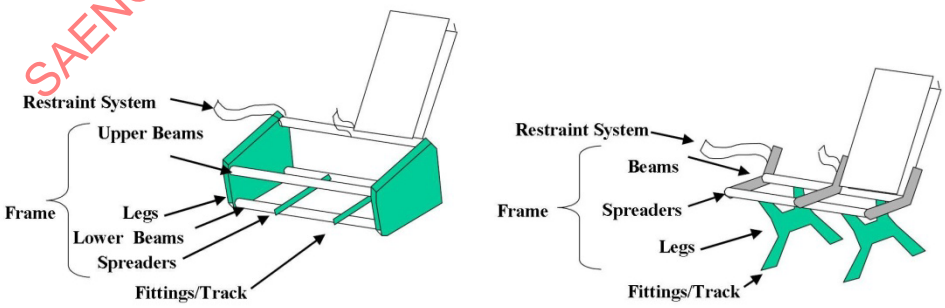


Figure 4 - Seat structure components that are not panels

Dress covers are not considered panels. Construction features of the dress cover materials such as local reinforcement, stitching, serging, and welting are also not panels.

Dress cover assemblies (not associated with a cushion assembly), that are not certified to 14 CFR Part 25 Appendix F, Part II are considered panels and must be evaluated to the 14 CFR Part 25 Appendix F, Parts IV and V.

5.3 Determining if the Part is Exposed

In the analysis of exposed versus unexposed, seat cushions and dress covers shall be removed from the seat to identify all seat components.

The following list defines exposed and unexposed parts and provides the requirements for evaluating items inside cavities in center consoles, armrest closeouts, and end bays.

5.3.1 Exposed

Panels that are directly exposed to the passenger cabin (directly visible from the passenger cabin) are exposed. Panels that are enclosed by a dress cover are exposed.

Panels that are partially or entirely above the seat pan level (note this is the pan, not the cushion) and are covered by another panel (traditional or non-traditional) are considered exposed, unless such panels meet the requirements of 14 CFR Part 25 Appendix F, Parts IV and V, or are exempted. For example, portions of panels covered by non-compliant food tray tables (traditional or non-traditional) are considered exposed.

Panels that are in direct contact with an exposed panel (traditional or non-traditional) are exposed.

5.3.2 Unexposed

A panel is considered unexposed if any of the following conditions are met:

- Panels that are completely behind an exposed exempted panel are unexposed.
- Seat backs, seat pans, legrest structure, and headrest structure that are covered by cushions that meet the requirements of 14 CFR Part 25 Appendix F, Part II are unexposed.
- Panels that are entirely below the seat pan level (note this is the pan, not the cushion) and are covered by traditional or exempted panels are unexposed.
- If a center console, end bay, seat end closeout, or armrest closeout is determined to be traditional, anything inside of the calculated surface-envelope is also traditional and does not need to be evaluated.
- Compliant, exempt, or resilient panels do not expose the underlying panel, if a gap of 1.0 inch (2.54 cm) or less exist between the compliant/exempt/resilient panel and the underlying panel.

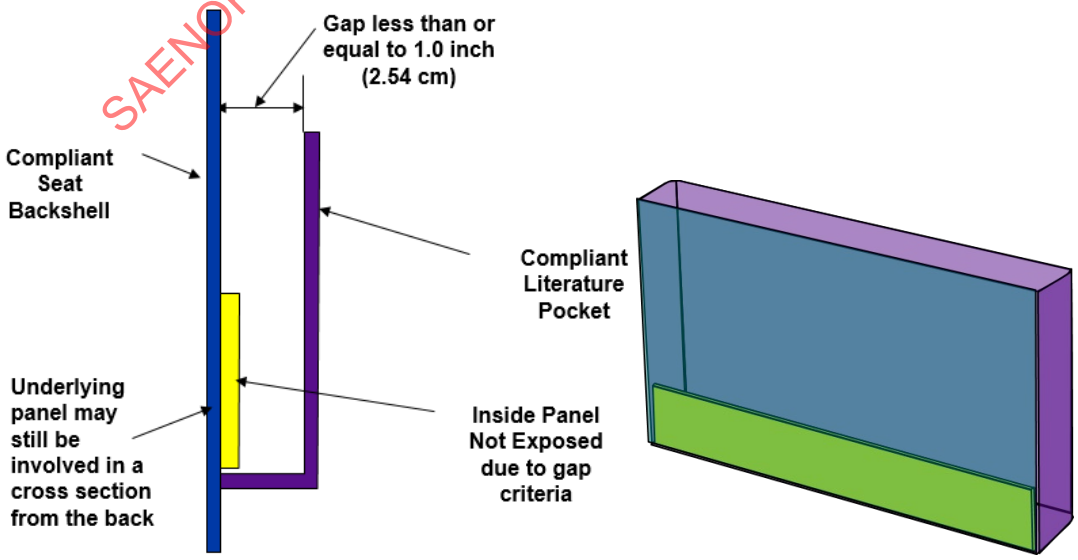


Figure 5 - Example shows a not exposed panel inside a compliant literature pocket

- Any panel surfaces facing the floor and located within 1.0 inch (2.54 cm) or less above the floor are not exposed.

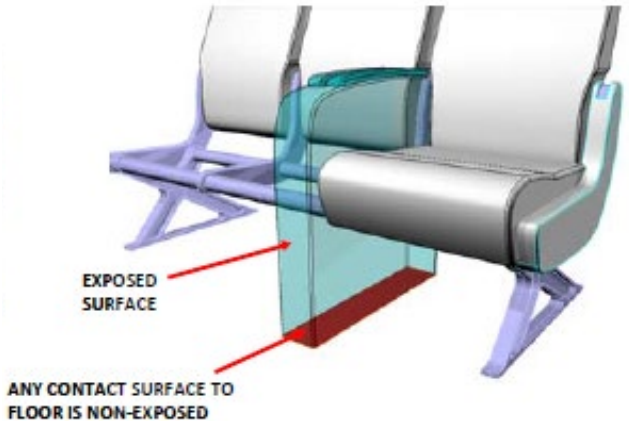


Figure 6 - Example of a n on-exposed hidden panel in contact with the floor

- Any panel laying behind two adjacent exposed panels is considered unexposed if the gap between the adjacent panels is 1.0 inch (2.54 cm) or less, and adjacent panels are either exempted panels or compliant panels. In this example, the underlying panel (purple) is not exposed, because the 1.0 inch (2.54 cm) underlying panel criterion applies.

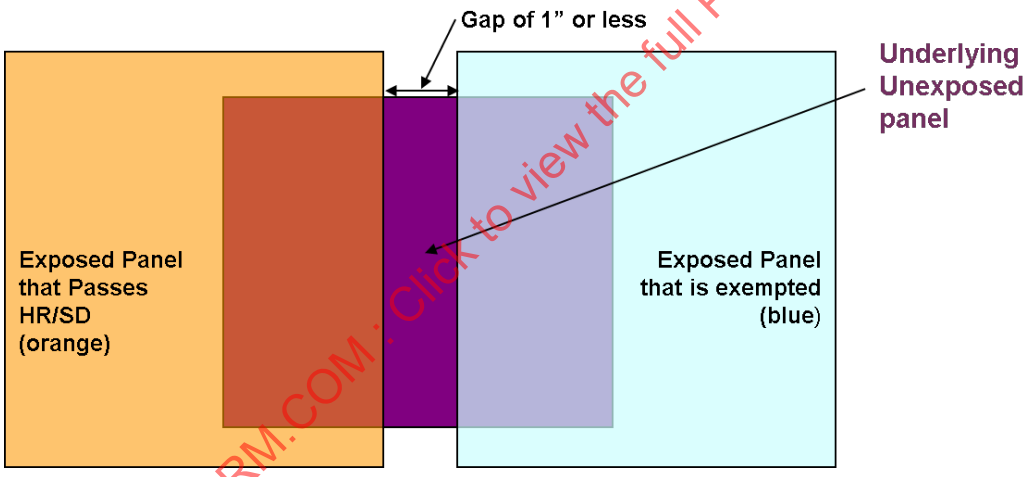


Figure 7 - Example shows an underlying panel that is not exposed

- If a gap of less than or equal to 0.25 inch exists between two panels, the underlying panel is exposed and compliance must be shown according to Table 3. If the gap is greater than 0.25 inch, the underlying panel is not exposed.

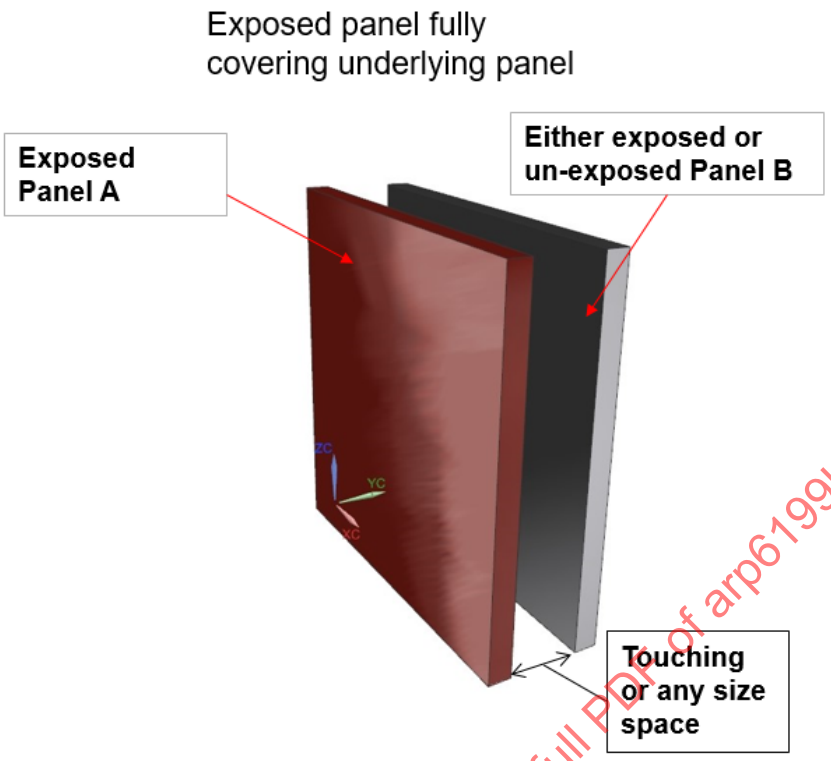


Figure 8 - Example of exposed panel fully covering underlying panel

5.3.3 Evaluating Overlapping Panels

Table 3 - Criteria for evaluating overlapping panels

Gap ≤ 0.25 inch (6.35 mm), Including Touching Non-Bonded Substrates Exposed Panel	Gap > 0.25 inch (6.35 mm) Unexposed Panel
Choose any of the following options*: 1. Test the exposed panel and if it is resilient then the underlying panel does not need to be evaluated for HRSC. 2. Test each panel independently. 3. Test the panels as a stack-up per type design (may be tested with zero gap).	Only the exposed panel “A” must be evaluated to HRSC

* If option 1 or 2 is used and fails, then another option may be used. Once option 3 is used and fails, then the design must be changed.

5.3.3.1 Test Method to Show Material Resilience

A material may be shown to be resilient by meeting the OSU heat release requirements evaluated per the test configuration shown in Figure 9.

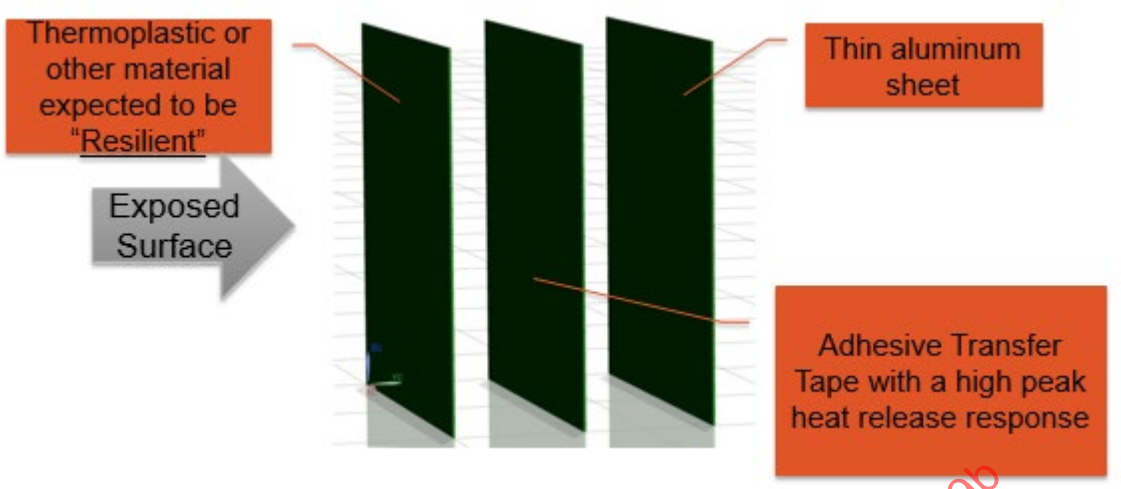


Figure 9 - Test configuration to determine resilient material

5.3.3.2 Test Requirements

The covering material shall be equivalent to the proposed panel thickness.

The aluminum sheet shall be no greater than 0.063 inch (1.60 mm) in thickness. Aluminum grade 6061 is recommended.

For the test to properly demonstrate resiliency, the underlying adhesive must be of a type that produces a high peak heat release value when exposed to the OSU test.

Tape characteristics shall meet the following when tested to the requirements of 14 CFR Part 25 Appendix F, Part IV:

- Peak heat release rate (HRR) value shall be at least 100 kW/m^2.
- The time to peak shall be less than 60 seconds.
- The peak event shall be greater than 30 seconds. The duration of the peak event is comprised of two inflection points: it begins approximately when the test curve crosses the zero HRR line and ends approximately when the downward slope of the test curve begins to level off. See Figure 10 for example.

NOTE: 3M (manufacturer) 9473 (part number) 0.010 inch (0.25 mm) thick has been shown to meet these requirements. Figure 10 shows the test data for a specimen set (three samples) using this tape.

5.3.3.3 Tape Performance Parameters (3M 9473 Example)

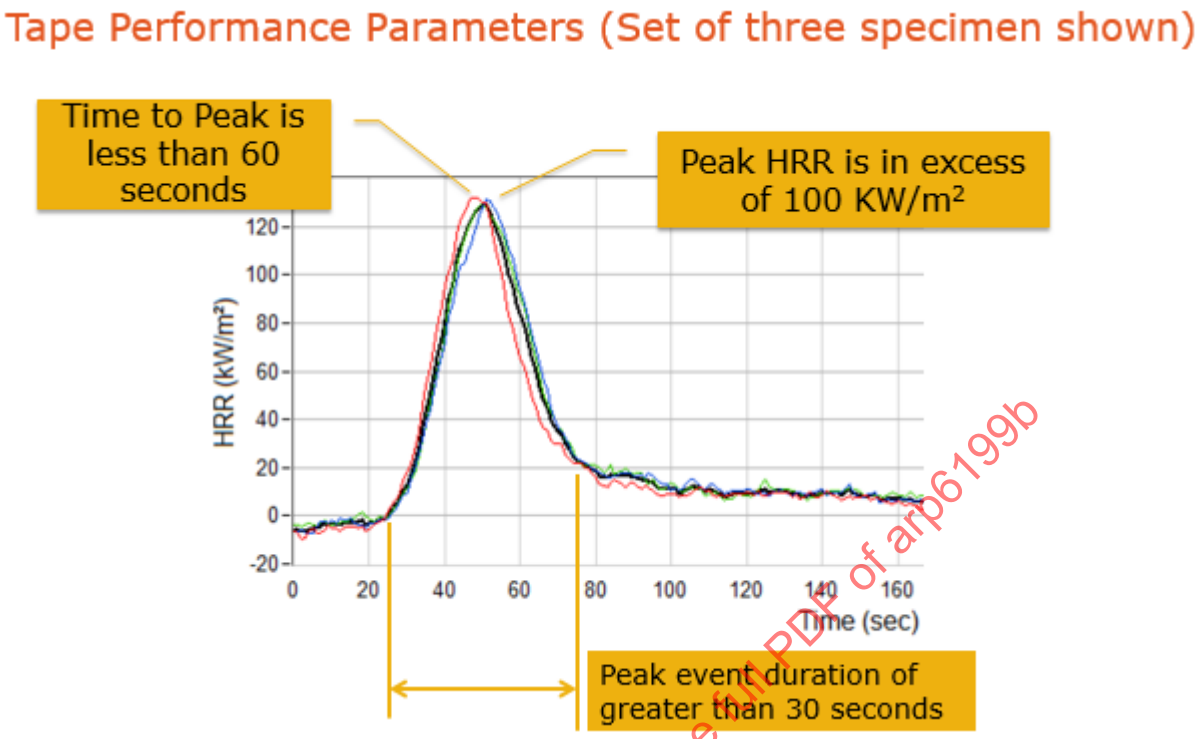


Figure 10 - Tape performance parameters

5.3.3.4 Resilient Test Guidelines

- The tests shall be run according to the guidelines in Chapter 5 of the Aircraft Materials Fire Test Handbook.
- The test to show resilience is a separate test than those used to demonstrate compliance to 14 CFR Part 25 Appendix F, Parts IV and V.
- The test to show that a thermoplastic is “resilient” shall be conducted with a test article that is designed as shown in Figure 9.
- If the heat release test is passing for the construction, the thermoplastic material at the prescribed thickness is considered “resilient” for purposes of evaluating overlapping panels (5.3.3).
- For a given thermoplastic material and thickness, the color and texture do not affect “resilience”; therefore, only a single test set per material brand/grade would be needed.
- If the material is coated with paint or a laminate film, and the base thermoplastic is tested for heat release (HR) and smoke density (SD) and passes, the passing test results of the base thermoplastic will be acceptable to show resilience. A test of the coated panel must demonstrate compliance to 14 CFR Part 25 Appendix F, Parts IV and V.

5.3.3.5 Resilient Test Data Presentation

The data necessary to show resilience shall be accompanied with:

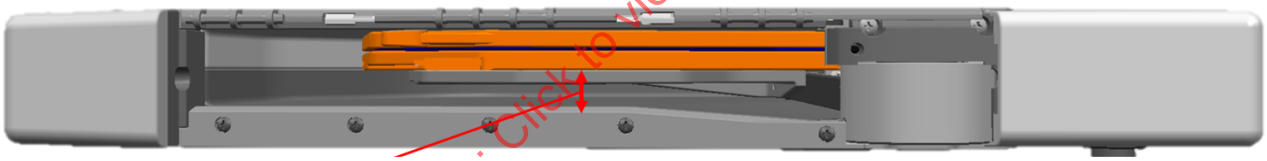
- OSU/heat release test results showing the performance of the adhesive transfer tape used on aluminum.
    - A minimum of three tape samples shall be tested and each sample heat release peak shall exceed 100 kW/m^2. In addition, time under peak shall be greater than 30 seconds and time to peak shall be less than 60 seconds (see Figure 10). In the Figure 10 example, the 3M 9473 tape has been shown to meet the tape criteria. However, all applicants must generate data for the tape they intend to use to determine the exposed substrate's resiliency.
- OSU/heat release test results of the resilient panel configuration to be qualified.
    - The average peak test result shall not exceed 65 kW/m^2.

5.4 Evaluating Cavities

Seat features such as center consoles, end bays, or armrest closeouts that are deemed non-traditional may include an enclosed cavity. Often, these cavities store video monitors and/or meal trays. Enclosed cavities might be covered by a traditional component, such as an arm-cap installed on an armrest closeout that contains an in-arm meal table.

To evaluate cavities, and their content, the following criteria must be used:

- If a cavity is covered by a compliant panel or an exempted panel, then the cavity is unexposed.
- If the cavity opening (the distance between the panel covering the cavity and the item(s) inside the cavity) is 1.0 inch (2.54 cm) or less, then the item(s) inside the cavity is unexposed.



Items inside a cavity (e.g., IAT) are unexposed if they are covered by a compliant or exempted panel with a distance of 1.0 inch (2.54 cm) or less.

Figure 11 - Example of an unexposed item inside a cavity

- If a cavity is being covered by an IFE component, such as a video monitor installed on the back of a seat, then the following criteria must be used to determine whether the area behind the IFE component is exposed:
    - If the IFE equipment meets the requirements of 14 CFR Part 25 Appendix F, Parts IV and V, then the area behind the IFE equipment is unexposed.
    - If the IFE equipment does not meet the requirements of 14 CFR Part 25 Appendix F, Parts IV and V, and the area behind the IFE equipment is considered a panel, then the area behind the IFE equipment is considered exposed.
    - If the IFE equipment is not compliant, and the area behind the IFE equipment is not considered a panel, e.g., there is a cavity behind the IFE equipment, then the area behind the IFE equipment is considered unexposed.

Items behind IFE equipment installed above the seat pan are considered exposed. However, the following items are not subject to HRSC:

- Support brackets.
- Seat back structure.
- Any items necessary for providing electrical power or data.

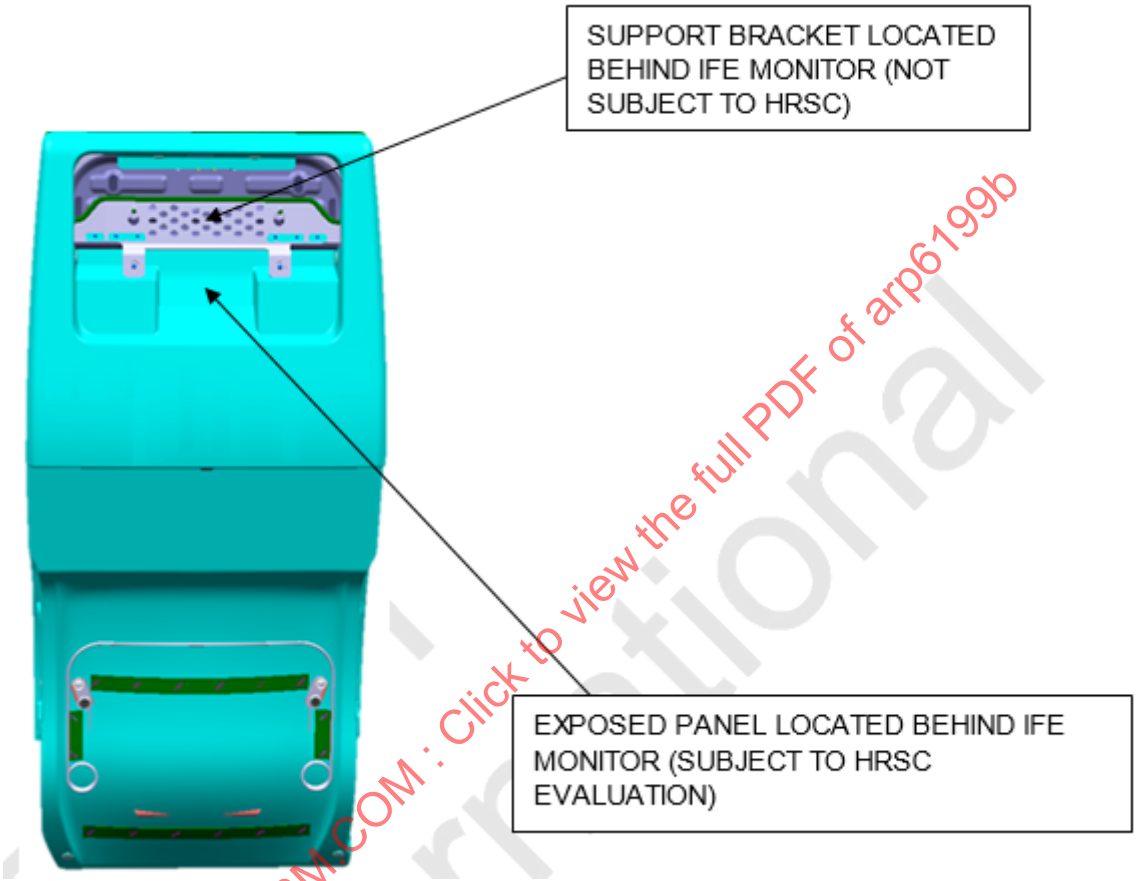


Figure 12 - Evaluating cavities behind traditional IFE equipment

5.5 Determining if the Part is Non-Metallic

All non-metallic panels must be evaluated.

Metallic components are not subject to the 14 CFR Part 25 Appendix F, Parts IV and V requirements. In order to be considered metallic and excluded from 14 CFR Part 25 Appendix F, Parts IV and V testing criteria, a panel that meets one of the following criteria is metallic:

- A component made entirely of metal or metallic components. The construction must not include both metallic and non-metallic layer(s) and components. A metallic component that does not have an applied organic finish, such as primer, paint, and powder coating.
- A metallic component with an inorganic finish (e.g., a corrosion inhibitor, a chemical conversion coating, alodine and anodize, chromate conversion, nickel plating, zinc plating, etc.).

5.6 Determining if the Part is Large

This section defines items that are not large and therefore they do not need to be evaluated.

- Items that occur once per seat place and have an exposed surface area less than 36 in^2 (232 cm^2).
- Items occurring more than once per seat place that have an exposed surface area less than 9 in^2 (58 cm^2) each and they are spaced more than 12 inches (30.5 cm) apart on the same surface.
- Items occurring more than once per seat place that have an exposed surface area less than 9 in^2 (58 cm^2) each, and they are spaced less than 12 inches (30.5 cm) apart on the same surface to form a combined surface area not greater than 36 in^2 (232 cm^2).

The following items having a specific function are considered not large, regardless of material and spacing, as long as they are sized as necessary to serve their intended function:

- Cup holders.
- Regulatory/safety placards.
- Coat hooks.
- Hook and loop tape (note that the intended function of loop tape is not limited to applications with hook tape, such as loop tape used to dampen vibrations or to prevent scratching).
- Tie straps.
- Straps for flotation device and life vests.
- Small rollers, pulleys, handles, knobs.
- Small electrical parts (capacitors, resistors, electrical tape, switches, etc.).
- Bushings, screw caps, clips, fasteners, washers, nuts, grommets, hooks, snaps, thread.

NOTE: A part that is determined to be not large may be bonded, or mechanically attached, to a larger part without losing its designation as a part that is not large.

5.7 Panels with Bonded Dress Cover

5.7.1 Dress Covers Affixed All Over

Seat designs with dress covers affixed (adhesively bonded, hook and loop, etc.) to non-traditional, large, non-metallic panels must be evaluated per one of the following methods. The method selected depends on the dress covering affixation design principle, i.e., meeting the traditional affixing criteria or the dress covering being completely bonded to the panel.

Method 1: Non-traditional, large, non-metallic panels covered with dress covers shall be evaluated for heat release and smoke without their coverings independent from the dress covering affixation design principle.

Method 2: Non-traditional, large, non-metallic panels covered with dress covers in a traditional way (affixed around the edges; see criteria below) shall be evaluated for heat release and smoke without their coverings. Non-traditional, large, non-metallic panels covered with dress covers in a non-traditional way (e.g., generally bonded/affixed all over to the panels) shall be evaluated with their coverings (see 5.1 for guidance regarding panels covered with dress cover assemblies; e.g., dress covers with padding, foam, batting, or cushioning materials).

Due to differences that currently exist in the regulators' expectations on how to show compliance, method selection must be consistent with the applicant's certification requirements. The regulators are in the process of harmonizing these requirements, at which point this document will be revised to specify only one method of compliance.

5.7.2 Panels Covered with Dress Cover Assemblies

The following criteria shall be used:

Seat backs, seat bottoms, leg rest structure, and headrest structure that are covered by cushions that meet the requirements of 14 CFR Part 25 Appendix F, Part II are considered not exposed. Other panels covered with dress cover assemblies compliant to 14 CFR Part 25 Appendix F, Part II might be considered not exposed depending on the thickness of the layer of foam. However, in principle, in case the cover/foam is bonded onto the underlying panel, the entire construction should meet the heat release and smoke density requirements.

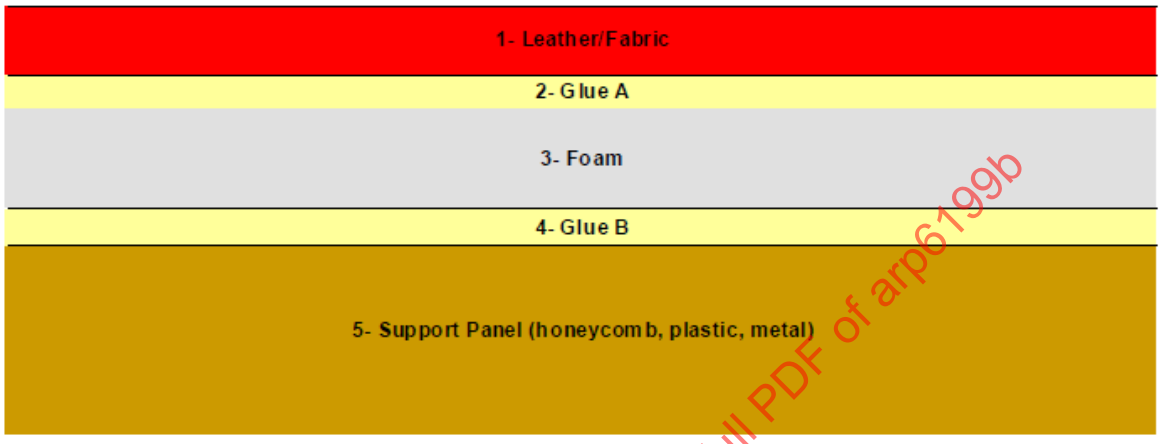


Figure 13 - Panel construction

With reference to the panel construction shown in the figure above, the following three options are acceptable:

Option 1: Substantiate for 14 CFR Part 25 Appendix F, Parts IV and V the entire construction (layers 1+2+3+4+5).

Option 2*: If the thickness of the foam (layer 3) is at least 0.25 inch (.64 cm), substantiate for 14 CFR Part 25 Appendix F, Parts IV and V the support panel (layer 5) only and substantiate layers 1+2+3+4 to 14 CFR Part 25 Appendix F, Part II.

Option 3*: If the thickness of the foam (layer 3) is at least 0.5 inch (1.27 cm), substantiate layers 1+2+3+4 only to 14 CFR Part 25 Appendix F, Part II.

* The seat cushion oil burner test/substantiation required by Option 2 or Option 3 must be conducted using specimens having a composition that meets the following conditions (refer to FAA AC25.853-1):

a. Dress cover must include the same material used to manufacture layer 1.

b. Specimens must be made using only the same foam used to manufacture layer 3.

c. The adhesive used to manufacture layers 2 and 4 must be included in the specimen design.

d. Additional fire blocking layer must not be included between the cover and the foam of the test specimen, unless representing the type design construction.

e. It is acceptable to design test cushions with layer 1 encapsulating the test cushion.

NOTE: If two or more types of adhesive are used in the design, the adhesive with the worst flammability performance in the 12 second vertical burn test must be used to encapsulate the test cushion.

5.8 Head Strike Protection

Paddings and their attachment method added to seat designs for the purpose of compliance with 14 CFR 25.785 do not need to meet the requirements of 14 CFR Part 25 Appendix F, Parts IV and V (refer to AC25-17A).

5.9 Calculation Methods

In the determination of non-traditional, the term “orthogonally projected area” is used to describe the process by which a three dimensional feature is rendered into two dimensional surfaces for which the area can be easily calculated. This process involves a perpendicular projection of the object onto three planes (horizontal, vertical, and lateral) to create a two dimensional area. The purpose of this calculation is to determine the overall size of the feature by surface area without regard to its material(s).

Design calculations may be substantiated by utilizing any of the following three options:

1. CAD orthogonal projected area.

2. Actual CAD surface area.

3. Manual orthogonal projected calculation.

NOTE: The dimensions of each surface must be provided regardless of which of the three methods above has been used.

If using CAD to calculate the actual CAD surface areas for seat end close out, armrest closeout, end bays, and center consoles, the allowable actual CAD calculated surface area size limits must be 10% less than if the CAD or manual orthogonal projected area methods are used.

Only one calculation method must be reported for each seat feature.

Table 4 - Traditional size limit criteria

Seat Feature	CAD Actual Surface Area Limits [Limits Reduced by 10%]		Manual or CAD Orthogonally Projected Area Limits	
	in^2	cm^2	in^2	cm^2
Center Console	907	5852	1008	6503
Seat End Closeout	310	2000	344	2219
End Bay	907	5852	1008	6503
Armrest Closeout (Standard)	389	2510	432	2787
Armrest Closeout (Front Row with a Video Storage Compartment and/or IAT)	907	5852	1008	6503
Footbar (Either Leg Rest-Mounted or Aft-Mounted)*	97	626	108	697
Food Tray Table	180	1161	200	1290
Monitor Bezel	104	671	115	742
Kick Panels (for Each Seat Place)	130	839	144	929

* Support bar shall be included in the calculation if it is non-metallic.

Surfaces within 1.0 inch (2.54 cm) of the floor (such as the bottom of a center console or end bay) do not need to be included in the area calculation.

Seat cushions must be removed when calculating the exposed surface area.

If the projected area is calculated by projecting each surface, through holes in each surface do not need to be included in the projected area. Example: Traditional attendant steps located in a seat end closeout can be deducted from the projected area calculation.

NOTE: Whether a center console, armrest closeout, seat end closeout, or end bay is determined to be traditional or non-traditional, traditional features listed in 5.9 mounted on them are traditional.

5.10 Traditional Versus Non-Traditional

The following features are typically considered traditional:

- Electrical components and accessories, such as but not limited to monitors, wiring, PCUs, PC and USB power outlets, touch pads, handsets, card readers, reading lights, proximity lights, electronic devices with any cradle features, etc.
- Escutcheons (the close-out cap for the front or rear of an armrest).
- Life vest straps and tamper proof seals.
- Trash trap seals and brushes.
- Mechanical/electrical recline components and their associated accessories.
- Protective or pinch preventative features.
- Rotating and handicap arm rests installed in between seats or on seat end closeouts.

5.10.1 Attendant Steps

Metallic and painted/powder coated metallic attendant steps are considered traditional.

Non-metallic attendant steps must be included in the projected area of the seat end closeout if they are not a separate feature mechanically attached.

Figure 14 - Examples of traditional and non-traditional attendant step

5.11 Flight Attendant Seats

- All flight attendant seats are typically traditional and do not require evaluation using 14 CFR Part 25 Appendix F, Parts IV and V (see below for non-traditional flight attendant seats).
- Flight attendant seats may be a single entity or several assemblies that are separately installed to perform their function (e.g., a wall mounted head rest).
- Attributes common to traditional flight attendant seats may include, but are not limited to:
  - Standalone (track or floor mounted) or wall mounted seats.
  - Seats that are sized for their function and location.
  - Have stowage for emergency equipment (e.g., life vest, flashlight, handset, smoke hood, PBE, fire extinguisher).
  - May include miscellaneous stowage.
  - Few in the cabin (typically near exits).
- Non-traditional flight attendant seats:
  - Are larger than needed to be to perform their intended function.
  - Have stowage for more than emergency equipment (closet for clothing).
  - Size of seat is driven by decorative requirements.

Figure 15 - Examples of traditional flight attendant seats

5.12 Headrests

All exposed non-metallic components must be evaluated for 14 CFR Part 25 Appendix F, Parts IV and V. Features covered by a cushion (such as on the front side of the headrest structure) or dress cover assemblies (such as on the back of the headrest structure) that meets the requirements of 14 CFR Part 25 Appendix F, Part II are unexposed.

NOTE: Materials behind moveable components, such as the material behind the rigid ear flaps (with dress cover removed) are considered exposed if there are no means (placard or AFM instructions) to control the position of the moveable components.

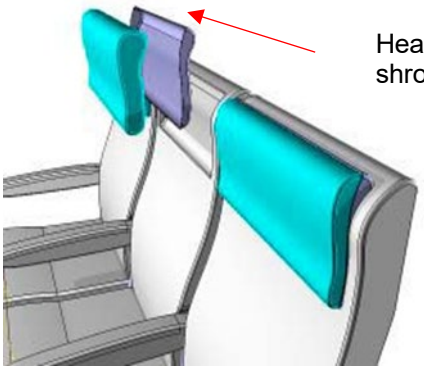


Figure 16 - Example of headrest shroud for evaluation

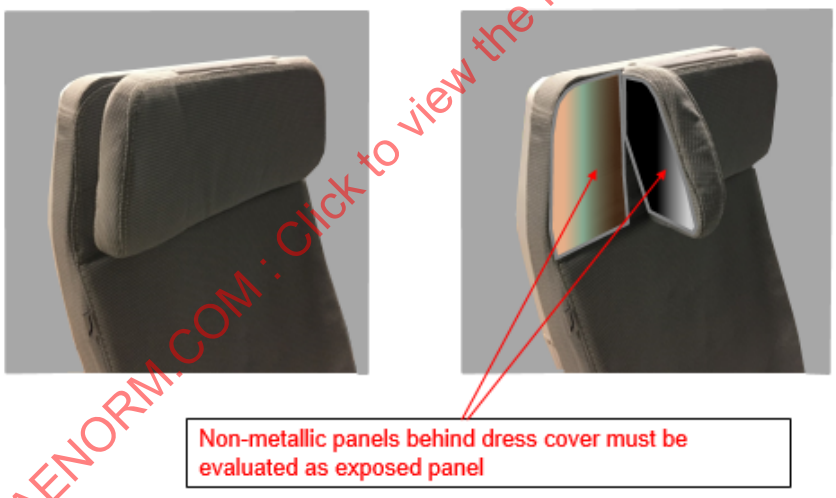


Figure 17 - Example of non-metallic panels behind dress cover

5.13 Privacy Dividers

Privacy dividers are non-traditional.

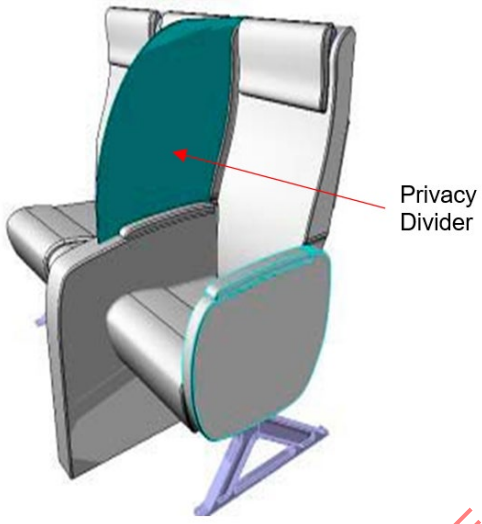


Figure 18 - Example of fully deployed privacy divider

5.14 Center Consoles, Seat End Closeouts, End Bays, and Armrest Closeouts

When calculating the projected areas of center consoles, seat end closeouts, end bays, and armrest closeouts, the areas that are required to be projected are shown in dark pink (magenta) color.

If a center console or end bay is determined to be non-traditional, the features mounted on them, listed in 5.10, are considered traditional and do not need to be substantiated for 14 CFR Part 25 Appendix F, Parts IV and V. In addition, cocktail trays installed on these features are also considered traditional.

All parts installed on a specific feature, such as life vest containers installed on a center console must be included in the projected area.

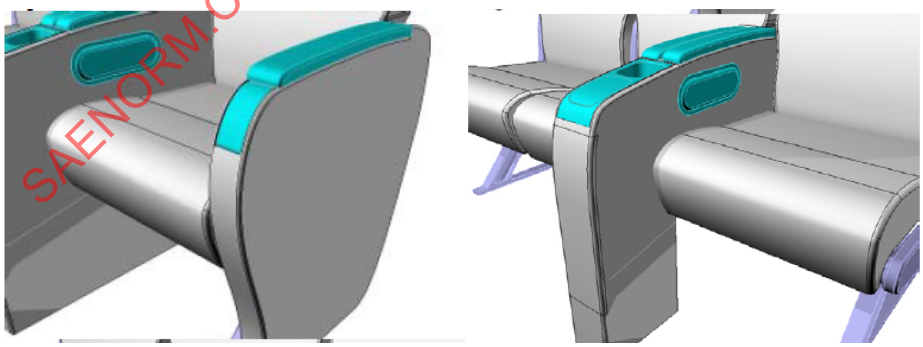


Figure 19 - Examples of traditional features mounted on non-traditional center consoles and end bays

5.14.1 Center Consoles

Center consoles separate individual seat places. They are normally wider than armrest closeout and tend to extend down, below transverse seat structures (e.g., beams).

See Table 4 for traditional center console size limit criteria.

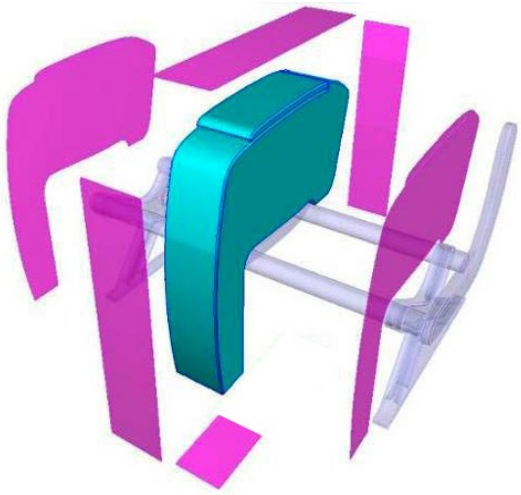


Figure 20 - Center console area calculation

NOTE: Only the bottom surface area of the center console that is not covered by seat structure and greater than 1.0 inch (2.54 cm) above the aircraft floor must be included in the calculation of the surface area.

5.14.2 Seat End Closeouts

Seat end closeouts are installed on the aisle side and/or wall side of a seat assembly.

See Table 4 for traditional seat end closeout size limit criteria.

If a seat end closeout is determined to be non-traditional, then the armrest (excluding the armcap which may or may not be traditional based on established size criteria; see 5.15 for arm cap criteria) is also non-traditional and shall comply to 14 CFR Part 25 Appendix F, Parts IV and V.

- Area 1 and 2 represent side and in-between spreader.
- Areas 3, 4, and 5 represent armrest only.
- Areas 6, 7, and 8 represent spreader only.

Area 6 definition: An angle between area 5 and 7 of 45 to 90 degrees.

Figure 21 - Seat end closeout area calculation (aisle view)

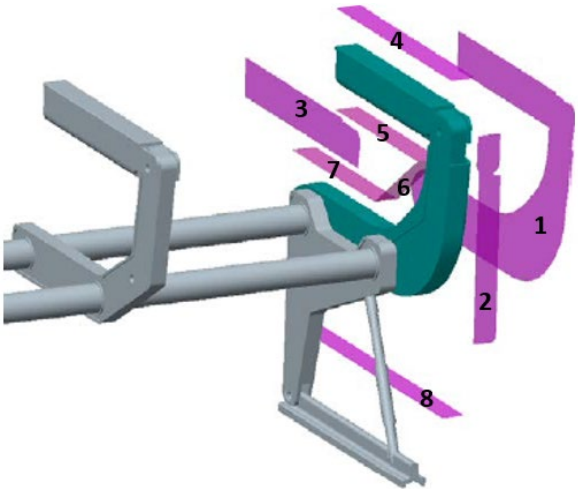


Figure 22 - Seat end closeout area calculation (inboard view)

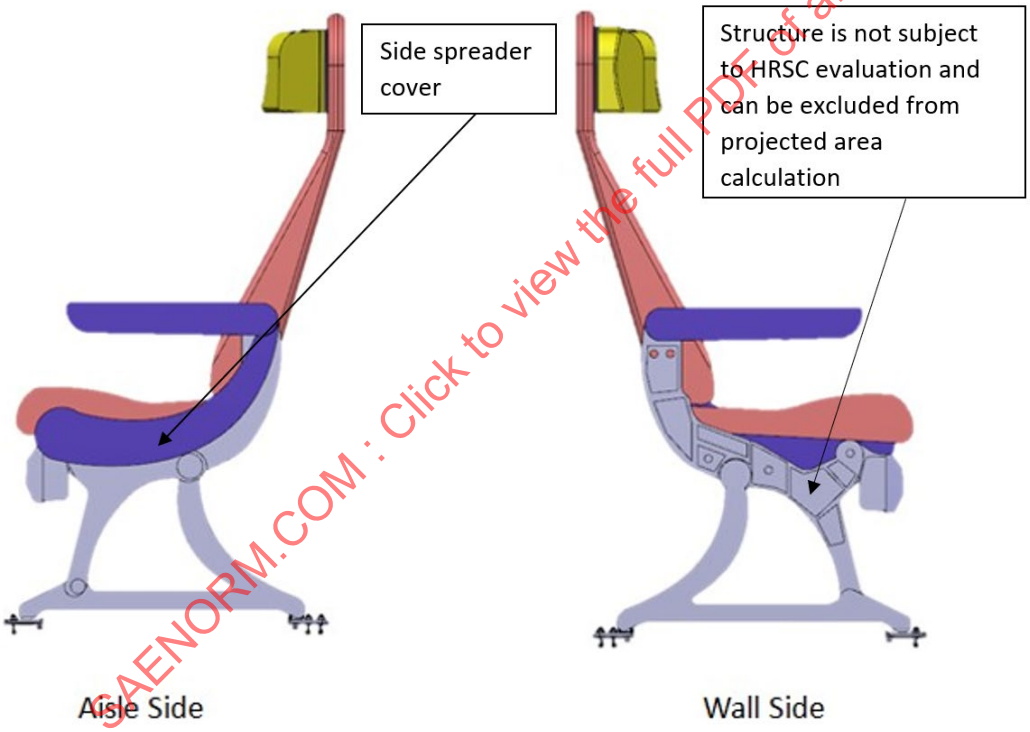


Figure 23 - Wall side seat end close out and side spreader cover

For “wall side seat end close outs” and “armrest closeouts,” calculating the projected area is an option but it is NOT required when:

- The seat structure is not covered by a spreader cover and therefore it is not subject to HRSC.
- The arm rest is traditional.

5.14.3 End Bays

End bay is installed on the aisle side and/or wall side of a seat assembly, but typically used on front and exit row seats.

See Table 4 for traditional end bays size limit criteria.

The following criteria is applicable for evaluating and substantiating video storage compartments installed on non-traditional end bays:

- Option 1: Video storage compartment is separate and it need not be tested to the requirements of 14 CFR Part 25 Appendix F, Part IV if it is sized appropriately to serve its intended function.
- Option 2: Video storage compartment is a continuous feature and it is required to meet the requirements of 14 CFR Part 25 Appendix F, Part IV.

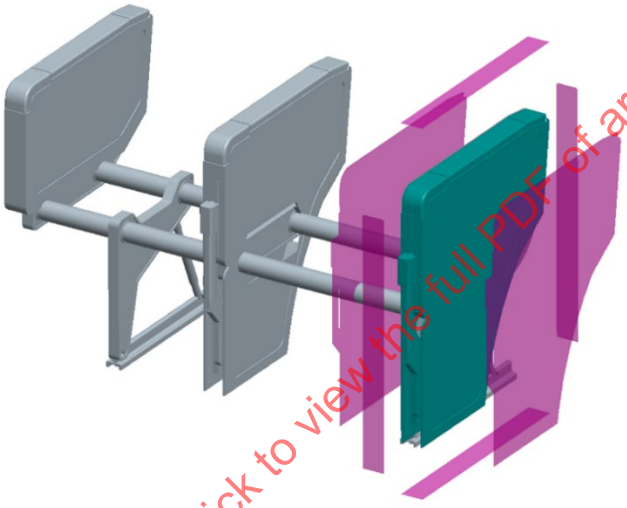


Figure 24 - End bay area calculation

NOTE: If the bottom of the end bay or armrest closeout is not greater than 1.0 inch (2.54 cm) from the floor, it does not need to be included in the area calculation. If it is greater than 1.0 inch (2.54 cm) from the floor, then it should be included in the area calculation.

5.14.4 Armrest Closeouts and Armrests

Armrest closeouts are typically used on front and exit row seats to separate individual seat places (see Figures 25 and 26). Rotating armrests are typically used on standard seats (see Figure 27) to separate individual seat places.

An armrest closeout may contain an in-arm articulated tray table or a video storage compartment. Figure 25 provides an example of an armrest closeout with an in-arm articulated tray table. Figure 26 provides an example of a front row armrest closeout with a video storage compartment.

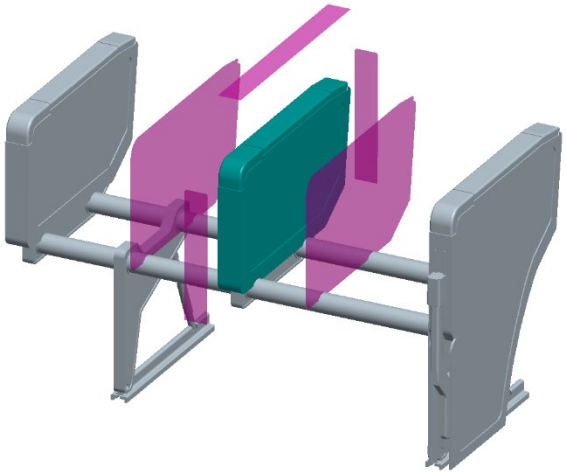


Figure 25 - Example of an armrest closeout with an in-arm articulated tray table

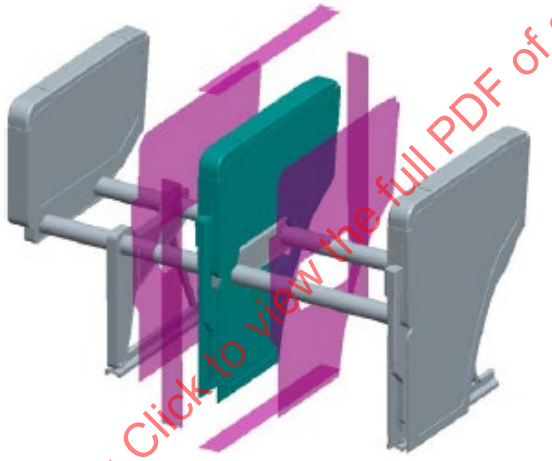


Figure 26 - Example of an armrest closeout with a video storage compartment

See Table 4 for traditional size criteria for armrest closeouts with, or without a video storage compartment.

The following criteria is applicable for evaluating and substantiating non-traditional video shrouds installed on non-traditional armrest closeouts with a video storage compartment:

- Option 1: Video storage compartment shroud is separate and need not meet the requirements of 14 CFR Part 25 Appendix F, Part IV and V if sized appropriately to serve its intended function.

- Option 2: Continuous feature; the video storage compartment must meet the requirements of 14 CFR Part 25 Appendix F, Part IV and V.

When evaluating standard row rotating armrests (located in between seats), the forward and aft decorative spreader covers, shown in blue color in Figure 27, must meet the requirements of 14 CFR Part 25 Appendix F, Part IV and V, if larger than 54 in^2 (348 cm^2). These limits apply to the complete forward surface and separately to the complete aft surface decorative spreader covers whether covered with a one-piece part or multiple piece-parts.

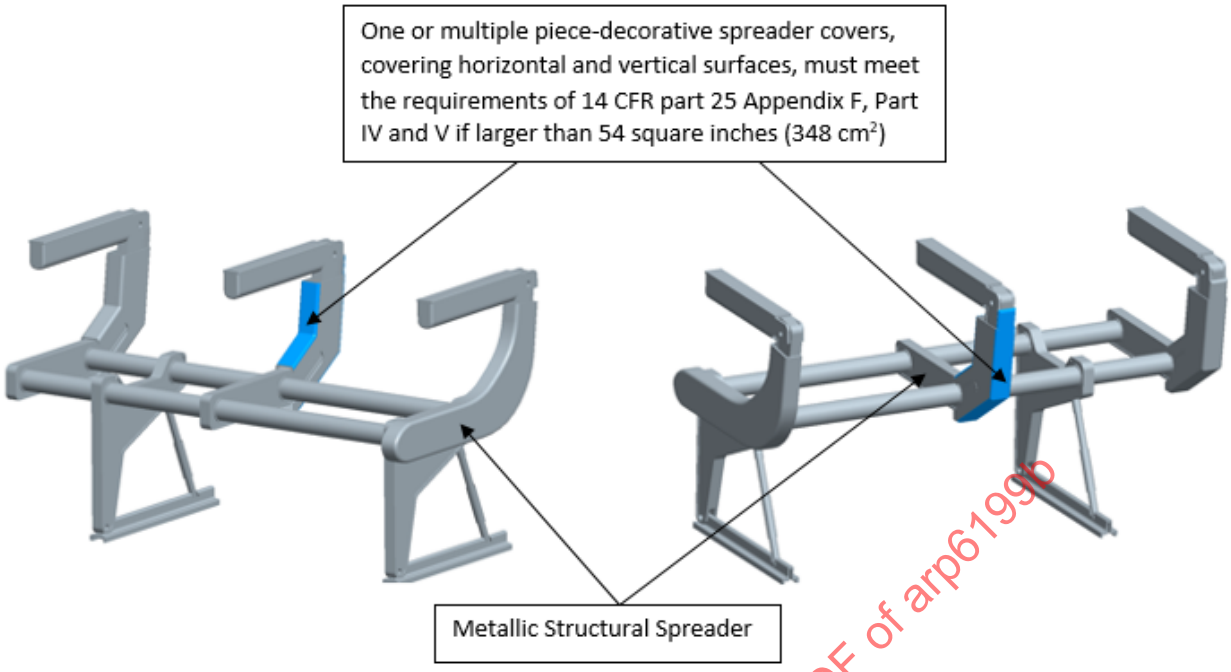


Figure 27 - Example of a standard row rotating armrests (located in between seats)

5.15 Arm Caps

Traditional arm cap size criteria:

- Arm caps smaller than 60 in^2 (387 cm^2) are considered traditional.

NOTE: Arm cap calculation only includes the arm cap top face (length x width).

If an arm cap is deemed non-traditional, the arm cap can be tested to either of the following:

- Oil burner test (14 CFR Part 25 Appendix F, Part II), using Method 2 listed 5.7.2.
- HR/SD test (14 CFR Part 25 Appendix F, Part IV and V) for large/non-traditional panels (dress covering guidance must be used for this test; i.e., remove the dress covering if not affixed all over).

Arm caps that are previously approved/certified for installation on an aircraft are not subject to the new arm cap size criteria.

5.16 Rub Strips, and Trim Strips

Rub strip: The material (typically non-metallic) mechanically attached or bonded to a panel for the purpose of protecting that panel from an impact of another object (e.g., a galley cart or luggage).

Trim strip: A capping material (metallic or non-metallic) attached to the edge or between panels for the purpose of closing out or protecting an edge.

These criteria for traditional and non-traditional rub strips and trim strips apply to both mechanically fastened and bonded items.

Rub strips and trim strips installed on traditional panels are themselves traditional.

Rub strips and trim strips installed on non-traditional panels shall be evaluated in accordance with the size criteria below:

- If their exposed surface area is 1.0 ft^2 or less, they are considered small enough that they are considered traditional.
- If their exposed surface area is greater than 1.0 ft^2 and meet any of the criteria below, they are considered traditional:
  - It has a bond line less than 1.0 inch (2.54 cm) wide on an individual item, or
  - It is located fully within 2.0 inches (5.08 cm) of the panel edge, or
  - It is located fully within 4.0 inches (10.16 cm) of the cabin floor, or
  - It is lineally* applied and less than 2.0 ft^2 (1858 cm^2) in total surface area on a panel surface.

* A rub strip is considered to be lineally applied when it is a long thin part typically with a width of 2.0 inches (5.08 cm) or less and the surface area is spread out in a long, narrow band.

Rub strips, and trim strips with an exposed surface area greater than 1.0 ft^2, which do not fit into the above criteria are considered non-traditional.

5.17 Seals and Brushes

Trash trap seals and brushes are traditional.

Flexible seals that are mechanically fastened or bonded and meet the requirements of Policy Statement PS 21 and are sized appropriately to serve their intended function are not panels and are not required to meet the requirements of 14 CFR Part 25 Appendix F, Parts IV and V.

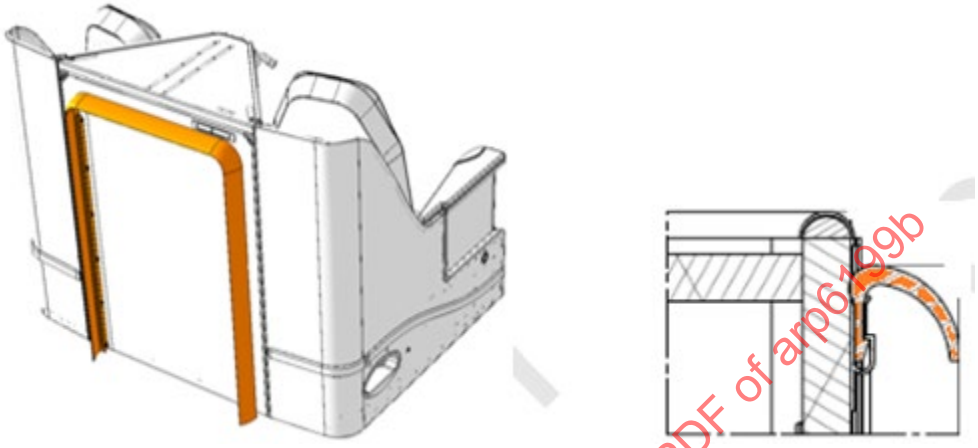


Figure 28 - Example of a silicone seal used as closeout

5.18 Shrouds

Shrouds provide protection to seat components and reduce risk of injury to passengers.

Traditional: Items which are serving the purpose of closing out electrical components (including bend radii for cables and other necessary clearances) and moving parts, seat belt alignment shrouds, drip shields, and shrouds used for finger pinch certification protection (14 CFR 25.601). These shrouds may be located anywhere on the seat, provided they are sized as necessary to serve their intended protective function throughout all phases of flight.

Material selection does not impact determination.

Non-traditional: Items with a primary purpose to screen or hide items which are not specifically listed in the traditional category. Decorative shrouds are non-traditional.

NOTE: Consoles are not shrouds although they may have shrouds incorporated into their design.

Figure 29 - Example of traditional shroud

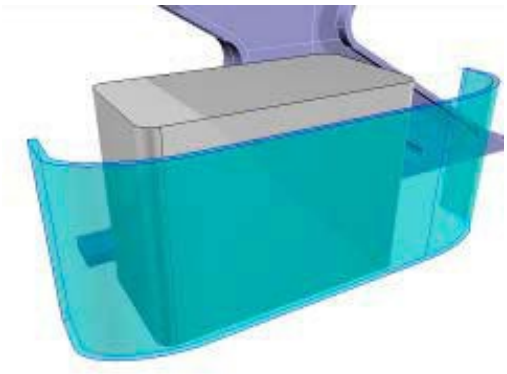


Figure 30 - Example of non-traditional shroud

5.19 Legrests

Legrest structures, their dress covers, and cushions are traditional.

Non-metallic panels, integral to the legrest construction, as well as shrouds and decorative features are non-traditional unless the shrouds provide protective functionality (such as protective cover for finger pinch). Traditional life vest pockets contained within traditional legrests are themselves traditional.

NOTE: Surfaces covered by cushions that meet the requirements of 14 CFR Part 25 Appendix F, Part II are unexposed.

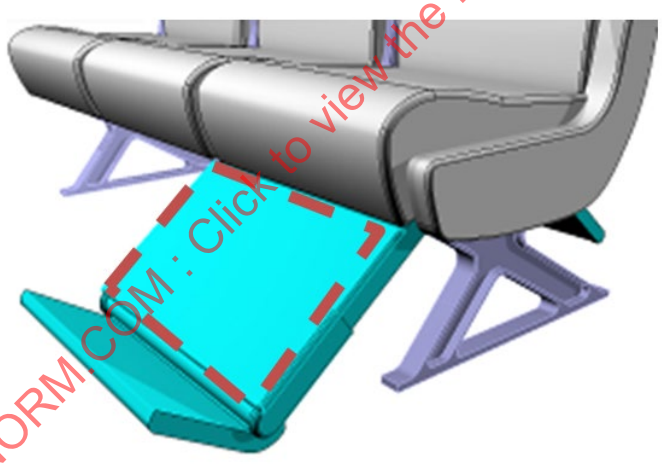


Figure 31 - Example of a deployed traditional legrest

5.20 Footbars

Footbars (either leg rest-mounted or aft-mounted) with a surface area of no more than 108 in^2 (697 cm^2) are traditional.

Support bars shall be included in the calculation if they are non-metallic.